Engineering Division

Significant Events Report

January 2002

This edition of the Significant Events Report includes profiles of Richard Jared, and Don Jourdain, who have both retired after more than forty years at the Laboratory. We welcome suggestions at any time for feature articles and profiles. Submissions and suggestions should be directed to: ser@lbl.gov. *We have also introduced a new feature in the Communications section; "Quick Tips," by Erick Herrarte and Dan Pulsifer, will provide tips and answer questions related to computers and software. You can submit questions or tips to* guru@lbl.gov.

Division Director's Comments –Jim Triplett

As we begin the New Year, we face a number of challenges. We will be following up on the initiatives we started last year when we began modernizing the shops and working to understand the inefficiencies and costs of in-house fabrication processes. We also started DesignWorks and Technical Integration Group, enabling us to provide engineering support to smaller science projects. To research new technology initiatives, we set up five committees to explore opportunities for engineering-sponsored research. We made substantial progress in upgrading the network to 100BaseT for all of Engineering. There is a significant effort underway to develop a true electronic document access and control system that is tied to our Product Data Management (PDM) systems. We made some significant organizational changes to streamline decision making and provide all Engineering personnel better access to HR, administrative, and career development support. This year we will see fewer new initiatives because we will be focusing our resources on following up and completing the activities and initiatives currently in progress.

With some of our people retiring this year, and others thinking about retiring in the coming year, I have been thinking about what the lab must have been like when they first started working here; how different the lab is today, and what it will be like to work here in the future. Dick Jared retired in December, after working 41 years at the lab. (See article in Profiles section below.) I have had some interesting conversations with Dick, Joe Jaklevic, and others about how the lab has changed over the years. It has occurred to me that the perspective of the interns, students, and young engineers may be very different than that of our senior engineers and managers. When some of our senior mangers started working at the lab there was no email, no internet, and no computers. Design was done on drafting boards with pencil and paper. Analysis was done by hand in a notebook with a slide rule and a good handbook. There were no CAD systems, ICs, printers or servers. Some of our managers started working at the lab before any human had been into space. Transistor radios from Japan were a modern marvel.

In contrast, when most of our young engineers, students, and interns were born, Neil Armstrong and the Apollo moon landing were being taught in high school history classes. They have never known a time when there wasn't a space shuttle taking people into space

regularly, or a computer in their home or school, or when Microsoft wasn't monopolizing the software industry. Going to the library to look through books to research a term paper is unknown to them because there were computers in the library that were connected to the internet. Some of them have never even seen a vinyl LP, and I bet most of them have never seen a record player. A lot of them have never owned a cassette tape since CDs replaced cassettes before they reached their teens. The Gulf War took place while they were in grade school, so they hardly remember it. The cold war was over before they reached puberty. Even though we as senior mangers have lived through many of these changes that have shaped our working environment, we need to be aware of the differences in perspective that we have with our new, youngest engineering partners. Being respectful of our differences and sharing our experiences with each other is good for all of us.

As we move forward, we need the experience of our senior engineers and managers to mentor our younger people and to keep us from repeating past mistakes. We also need the enthusiasm, energy, and creativity of our younger people to help create the positive atmosphere necessary to take on difficult and exciting new challenges.

News

Joe Jaklevic Featured on Lab's "Did You Ever Wonder?" Site –Paul Harris

Examples of Joe Jaklevic's work with the Crystal Robot, X-ray Fluorescence Detectors, Colony Picker, and other Bioinstrumentation endeavors are a prominent feature in the latest edition of Berkeley Lab's "Did You Ever Wonder?" website located at http://www.lbl.gov/wonder/index.html.
The website, launched in August 2001 (see *Berkeley Lab Currents*, August 10, 2001), is part of a new community outreach program that includes educational brochures for schools, and posters displayed on the Laboratory's shuttle buses. The website receives an average of 5000 visitors per week.

Engineering Division Website Gets a Facelift – Paul Harris

The site redesign described in the last *Significant Events Report* has been released. The new design adds functionality and database integration. The A-Z index is now operational, and searchable capabilities and projects will follow. See the Communications section below for more information about new features and work in progress.

Have You Seen Me? Inventory Items Missing –Barbara Davis

I would like to send my thanks to everyone for their cooperation during the wall-to-wall inventory, completed November 30, 2001. We were able to locate 1169 of the 1182 items for which Engineering Division is responsible. To avoid paying almost 66K to DOE, we must find the remaining 13 items by January 31. Please review the list at the end of this *Significant Events Report*; if you can identify any listed items please contact me. More detailed information is available in the Property & Space section below.

Peter Denes Appointed EE Department Head – Jim Triplett

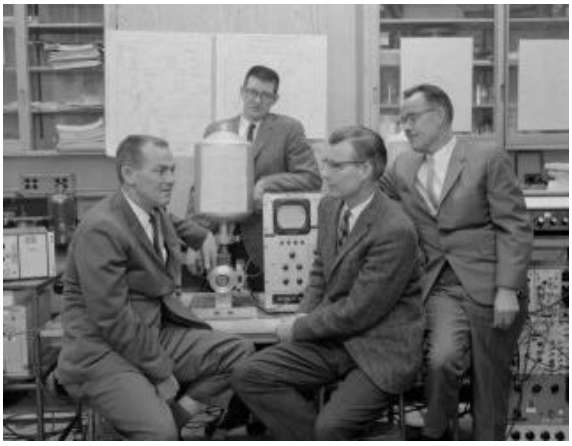
I have appointed Peter Denes as the new Electronics Engineering (EE) Department Head effective immediately. I would like all of you to give Peter the support he needs to continue to make improvements to the infrastructure and manage the department.

I want to thank Richard Jared for his efforts the last couple of years as Department Head for the Electronics Engineering Department, and of course for his 41 years at the Lab. Since Dick took over as EE Department Head, there have been many positive changes helping to bring the department together and improve the infrastructure.

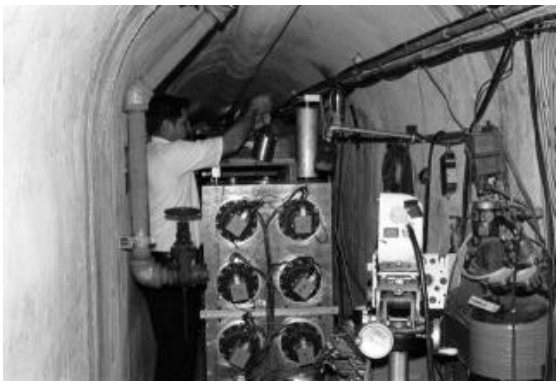
Profiles

Richard Jared -Paul Harris

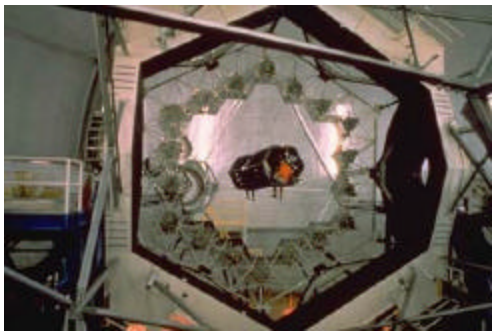
California native, Richard Jared, began his career at Lawrence Berkeley National Laboratory in 1961. He was first assigned to the Nuclear Science Instrumentation Group to repair vacuum-tube instruments. He soon taught himself to repair and modify pulse-height analyzers and related systems. In 1970, Richard graduated from UC Berkeley with his degree in Electronics Engineering and Computer Science. He holds a patent for "Application of Silicon Detectors for X-Ray Fluorescence Analysis" with co-inventors Earl Hyde, Stan Thompson and Harry Bowman (pictured below).



Richard is well known for his experiments with super-heavy elements in the Orinda BART tunnel (see photo below) in the 70's. He recalls, "Theory predicted half-lives sufficiently long for Element 116 to still exist in nature. Many samples were examined to determine if there was fission with large numbers of neutrons emitted." While working on this project, he borrowed a gold nugget collection from Nevada County, California. The county managers insisted the team install an electronic alarm system in the BART tunnel to prevent theft of the valuable collection. He performed experiments with 3 kg of moon rocks, almost the entire available supply at the time. "I was also required to have a police escort from the Livermore Lab when I borrowed 60 pounds of plutonium for experimentation in the tunnel. That was interesting." The search for Element 116 in nature ultimately proved negative.



Throughout his career, he has been involved in a variety of research projects in the fields of high-energy physics and nuclear science research and development, including the original Time Projection Chamber, and the highly lauded KECK Telescope. His designs of electronics instrumentation are widely used throughout the research community today. "I have been very fortunate to have been able to make significant contributions to science and engineering. Some of these contributions include being co-discoverer of some 20 isotopes in the neutron-rich products of fission fragments; building the electronics for seven multi-million-dollar particle-detector systems that supported high-energy physics research; and last, but not least, the design and construction of the mirror active control system for the KECK 10-Meter Telescope on the big island of Hawaii."



Dick's retirement plans include travel to England and Scotland this spring, and renovations on his houses in Martinez and South Lake Tahoe. He also intends to travel to CERN in Geneva, Switzerland to continue his research on the ATLAS project.

"After 40 years at LBNL, I can truly say that my career has been rewarding and challenging. My choice in becoming an electronics engineer has allowed me to pursue excellence in contributing to the advancement of science. This will continue into the future since the race for advanced technologies is ongoing."

Photographs are courtesy of the LBNL Photo Archives.

Don Jourdain – Paul Harris

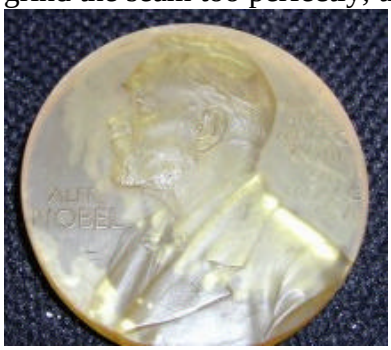
On December 18, 1961, a young machinist, Don Jourdain, began his 40-year career with the Engineering Division. He recalls, "My first day was great. I met a lot of interesting and friendly people. I only had to work three days before the holiday shutdown. They told me to go home for two weeks! I had never had a two-week vacation before!"

Don has seen many changes in the lab during his tenure. "Back in those days, Accelerator Tech's did everything; plumbing, carpentry, maintenance and the like." He recalls the lab being much bigger in the 60's. "Building 25 had around 40 people working on day shift and 10 or 12 working on swing shift. There was a 2 or 3-day wait to work on some machines. The Bevatron and the Cyclotron each had their own side shops, and we were doing more big experiments."


Don Jourdain shows the ropes to his successor, John Schaffer.

"Attitudes have changed," Don says. "The Lab has always had a good attitude, but it used to be much more friendly and laid back. We would talk and visit and it was much more fun."

Don describes himself as a "first-class machinist," and he is well known in the Laboratory as an expert in plastics. He is responsible for the Nobel Laureate plaque replicas on display around the lab. "I had to check out the solid-gold medallions with the cops, create the mold, and check them back in every night." He added, "I had to cast one side of the medallion at a time, then glue the halves together, and finally grind the seam to make it appear whole. You can't grind the seam too perfectly, though, or it won't look authentic." The resulting plastic copies were then vacuum coated with gold to create an almost perfect replica. "They're obviously lighter than the originals."



Don has graciously agreed to return to the lab on occasion to help mentor his successor in the Plastics Shop, and ensure that his customers continue to receive expert service.

"I'm going to really miss working here," he says of his retirement. "I guess I'll have to paint my house again and again."

Service Recognition –Pamala Williams-Perkins

	October	November	December
40 yrs			Donald Jourdain
30 yrs	Jack Smith		
25 yrs		Christopher Timossi George Zizka	Barry Bailey Richard Kuiper Lewis Popp
20 yrs		William Strelo	
15 yrs	Rene Delano		
10 yrs	Mary Stuart		Doyle Byford
5 yrs	Christopher Hack Robert Patton Ahmet Pekedis	Thomas Perry	

Retirees –Leslie Cobb

October: Loren Shalz, Jack Smith
December: Richard Jared, Don Jourdain

Reclassifications & Promotions –Michelle Gachis

The following is a list of employees who were recently promoted:

Bob Connors
Richard Demarco
Wayne Greenway
Roy Hannaford
Greg Morrison

Ray Chen changed disciplines from Mechanical Engineer to Computer Systems Engineer.

New Career Employees –Leslie Cobb

John Schaffer joined the Technical Integration Group (TIG) in January. He was most recently employed at Oster Magnetics and Lawrence Livermore National Laboratory. John has many years of machining and CNC programming experience. Since joining TIG, he has been learning plastics techniques from Don Jourdain.

Eric Williams joined the Software Engineering ALS Controls Group, reporting to Alan Biocca, in November. He attended UC Berkeley as a Computer Science major. Eric specializes in hardware interfaces and device drivers.

Significant Events

Student/Internship Committee –Bill Edwards

Any department that is interested in hiring a co-op student should consider applying now, as we hire in the spring and summer. You can get more information from the Student/Internship web site (http://engineering.lbl.gov/sip/student.htm), or by contacting your Department Head.

We have plans to attend several career fairs in the near future and to visit schools including, UC Berkeley, Stanford, UC Davis, Cal Poly SLO, and UCLA. We should have a lot of resumes available for review.

There are currently four interns in the division; two in Electronics Engineering, one in Engineering Tech Transfer and DesignWorks, and one in Mechanical Engineering. There are currently postings for two intern positions: one in micromachining, and one in Software Engineering for ALS Controls.

Diversity Committee –Deb Hopkins

Meetings have been held with Rollie Otto and Laurel Egenberger of LBNL's Center for Science and Engineering Education. They have programs in place and experience that may help us accomplish some of our goals such as developing collaborations with faculty at Historically Black Colleges and Universities. Bob Candelario continues to work with faculty at San Francisco City College to develop a program to work with their students training to be electronics and mechanical technicians.

Division Staff Visit Castlemont High School

The Diversity Committee is spearheading an effort to work with students and teachers at Oakland's Castlemont High School. The first collaboration will be supporting the school's robotics team, who has entered a national competition in partnership with Arroyo High School in San Lorenzo. In December, Brian Butler, Nathan Ferris, Erick Herrarte, Jim Triplett, Vic Karpenko, and Deb Hopkins visited Castlemont to learn more about the robotics competition and

how we can best support the students and teachers. Paul Harris, Brian Butler, Mehdi Malek-Amedi, Clifton Jones, Bart Davis, Seth Harris, and Deb Hopkins visited again in January for a Saturday working session. The FIRST Robotics Competition is a nationwide event that is expected to reach more than 20,000 students representing over 600 teams in 17 regional competitions. The rules for this year's competition were released on January 5th when each team received their robot building kit. Teams have only six weeks to build their robots. The competition is designed to foster teamwork and collaboration. Each competitive event teams two groups at random who must work together as a single team.

The next few weeks will require an intense effort to design, build, and test the robot. One of the ways we can contribute to the team is to provide tutoring on Wednesday afternoons from 2:30 until 4:00. Castlemont is in Oakland, on MacArthur Blvd. If you would be willing to go to Castlemont to tutor, please contact Paris Gordon, who will coordinate the effort. We will also be participating in working sessions at Castlemont, mostly on Saturdays. Our role is to support the kids without interfering; they will likely learn more from their failures than their successes, and the pride of accomplishment should be theirs alone.

The challenge for the future will be in identifying ways to continue working with the teachers and students at Castlemont on a year-round basis in a way that both contributes to the robotics effort, and contributes to the students' education.

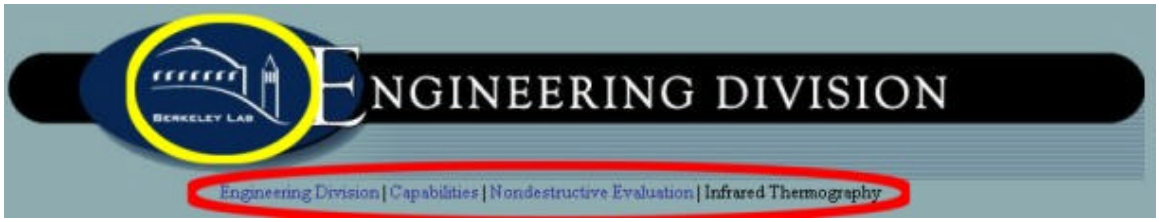
Communications –Deb Hopkins, Paul Harris, Erick Herrarte

Website -Paul Harris

As reported in the News section, the site redesign was released on January 3. Some users experienced a brief period of server failure caused by a broken DSN connection to the StaffPlan database. Service was restored within two hours, and there have been no further interruptions in server stability.

Navigation Tips:

You can access the main LBL website from any page by clicking the logo highlighted in yellow below.



You can easily find your location within the website by checking the status bar immediately below the title graphic. The status bar is highlighted in red above.

Contact information, when available, can be accessed at the bottom of every page, along with an email link to the Webmaster and the Laboratory Privacy and Security Notice. The following graphic shows the location of these links:

Issues:

Some Netscape 4.7x users have reported the occasional appearance of source code at the head of various pages. This is a known issue with Netscape and the use of server-side scripts (used to drive the database information). This causes no apparent functional interruption, and the code will usually disappear if the page is reloaded.

Efforts are underway to improve the download time for dial-up modem viewers.

Statistics:

During the period of November 1, 2001 through January 1, 2002, the Engineering Division website received a total of 99,741 hits by 7094 viewers. An average of 110 visitors per day make an average of 1,559 hits.

Please direct all correspondence to engweb@lbl.gov.

-Erick Herrarte and Daniel Pulsifer

Have you ever wanted to check your IMAP4 e-mail disk usage? Ever wondered how to change your IMAP4 password? Here is a quick tip to show you how you can access and manage your e-mail account. This works best if you are using Netscape 4.7.

- *Option 1*: Checking your IMAP e-mail disk usage

    1. Login to the web interface located at: http://www.lbl.gov/mail
    2. Once you have logged in, your total disk usage is displayed at the bottom of the page.
    3. You can also click on "Folders" located in the upper-left corner. You will then see the disk usage for each folder as well as the total disk usage.

- *Option 2*: Checking your IMAP e-mail disk usage and changing your IMAP password

    1. Visit: http://imapc.lbl.gov:10000/bin/user/admin/bin/enduser
    2. Enter your IMAP user id and password.
    3. To check your disk usage, choose "Account Summary" located on the left menu bar.
    4. To change your password, choose "Password" from the left menu bar and follow the simple instructions.

More information about managing your IMAP account can be found at the Computing Infrastructure Support Group's web page:
http://www.lbl.gov/ITSD/CIS/faqs/IMAP_Messaging.html

Additional information appeared in *Berkeley Lab Computing News*, March 1999:
http://www.lbl.gov/ITSD/CIS/compnews/1999/March/imap4.html

New Initiatives –Joe Jaklevic

The initiative committee met with the five subcommittees tasked with investigating possible opportunities in selected technical areas. The group meeting was designed to review progress and recommendations that had been developed by the topical subcommittees. The targeted technical areas were sensors, MEMS/nanotechnology, robotics and automation, engineered materials, and software systems. Substantial progress was reported in understanding the issues and opportunities related to these areas. Several concrete proposals were discussed. Division management is currently reviewing these ideas with a commitment to establishing specific activities directed toward new initiative development.

Anti-terrorism Projects

The Division is currently collaborating with AFRD and Nuclear Science staff in developing a series of proposals that exploit the unique capabilities of Ka-Ngo Yeung's neutron generator in active interrogation of contraband material. By combining the intense neutron flux available using these devices with appropriate detector technology (an area where the Division also has considerable expertise), systems tailored for a number of screening applications are possible. These include monitoring luggage, cargo containers, trucks and even entire aircraft for the presence of nuclear material, high explosives and other selected contraband. The technology can also be adapted for the classification of mixed waste and the detection of land mines. Proposals are being prepared for submissions to DOD, DOE and other agencies.

Tech Transfer and Industry & Energy Partnerships –Deb Hopkins

Tech Transfer and Industry Partnerships, along with the Technical Integration Group, welcome Paris Gordon, who will be providing administrative support to the groups half time.

Mehdi's Robot –Deb Hopkins

College student Mehdi Malek-Ahmadi is building a robot that will be used to test sensor technologies. Mehdi has scrounged parts from his motorcycle and the junkyard, and learned ProE to design parts he is machining. Mehdi started a Robotics Club at Contra Costa College where he is in his second year. He hopes to transfer to UC Berkeley next year to major in Mechanical Engineering. Mehdi is in the NDE Group, and works closely with his EETD mentor, Howdy Goudey. In addition to his NDE and robotic work, Mehdi has contributed to collaborative projects with EETD researchers.

Compelling Representation of Engineering Data and Information – Bart Davis

Bart Davis and Erick Herrarte attended a one-day course on "Presenting Data and Information," given by Edward Tufte in San Francisco. From the many examples that Tufte presented, they found his recounting of the Challenger disaster to be of most interest to Engineers. The loss of this vehicle and its crew might have been averted if a presentation by Morton-Thiokol engineers to NASA on a known problem with O-rings had been more convincing. The Morton-Thiokol engineers predicted the O-ring failure that caused the Challenger disaster, and on the day before its launch, recommended to NASA that the craft not be launched (their only no-launch recommendation in 12 years). The materials prepared by Morton-Thiokol to support their no-launch recommendation, however, failed to persuasively make the intended point: that low temperatures would likely cause O-ring failure.

All the information necessary to draw the conclusion that failure was very likely was contained in the presentation, but obscured in such a manner that it did not convince NASA flight controllers. Tufte's representation of the same data would likely have succeeded in convincing the flight controllers to scrub the launch. The Morton-Thiokol presentation makes a good case study in mistakes to avoid in the presentation of engineering information: learn to be persuasive, or you may be ignored even though you are correct. Erick and Bart recommend the course; well-known books by Tufte were part of the course materials, and can be borrowed from either Bart or Erick.

Nondestructive Evaluation –Deb Hopkins

Fred Reverdy and Deb Hopkins traveled to Detroit in December for several meetings. They met with the NDE Group's industry steering committee to discuss evaluations underway to assess the state-of-the-art of spot-weld inspection using acoustic methods. They met with their DOE program manager and representatives from the National Center for Manufacturing Sciences to discuss ways that NDE could contribute to automotive manufacturing in the short and long term. They also met with researchers at DOW Chemical to discuss inspection of adhesively bonded components using infrared thermography.

Fred Reverdy, Deb Hopkins, and ESD's Kurt Nihei visited Lawrence Livermore National Laboratory's (LLNL) NDE group in November. Several members of LLNL's NDE group visited LBL earlier in the year. The LLNL group provided tours of their extensive facilities and laboratories, and the two groups discussed opportunities for collaborative work.

A paper written by Fred Reverdy and his Ph.D. advisor Bertrand Audoin at the University of Bordeaux titled, *Ultrasonic measurement of elastic constants of anisotropic materials with laser source and laser receiver focused on the same interface*, appeared in the Journal of Applied Physics, 90 (9), November 2001. A second paper in French by the same authors, *Evaluation de l'élasticité d'une couche de revêtement anisotrope par technique ultrason-laser,* (*Evaluation of the elastic properties of an anisotropic layer deposited on a substrate using a laser ultrasonic technique*) has been submitted for publication by the Laboratoires des Ponts et Chaussées (Laboratory of Bridges and Roads), which publishes a Civil Engineering journal. These papers are based on Fred's dissertation research, which has many applications for the nondestructive measurement of material properties.

Vehicle Retrofits – Daniel Türler

Results from two vehicle retrofit projects have been summarized in a paper titled, *Reductions in Accessory Loads Using Gas-Filled-Panel Insulation and Advanced Window Technologies: Results of Two Vehicle Demonstration Projects*, by Daniel Türler, Howdy Goudey, and Deb Hopkins. The paper is being submitted to the Society of Automotive Engineers.

Advanced lightweight insulation and window technologies can contribute significantly to achieving industry and government goals of substantially improving fuel economy without loss of vehicle performance or passenger comfort. Two conventional passenger automobiles, a 2001 Lincoln Navigator and a 1999 Ford Taurus, were retrofitted with lightweight insulation and specially designed windows to reduce heating and cooling loads, which allows downsizing of heating, ventilation, and air conditioning (HVAC)

equipment. The retrofit projects have been described in previous *Significant Events Reports*. Benefits derived from use of advanced insulation and window technologies include:

- Demonstrated reductions in cooling loads;
- Fuel savings for conventional and hybrid vehicles;
- Extended range for electric vehicles;
- Greatly improved passenger comfort;
- Reduced degradation of interior surfaces; and
- Improved safety through reductions in glare and heat.

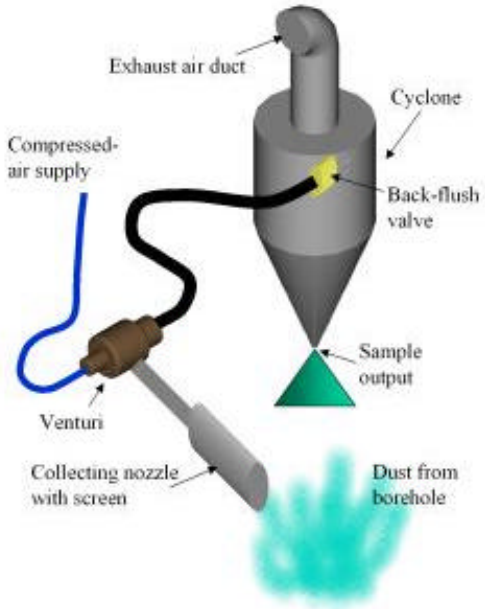
Mining – Murat Karaca

A paper titled, *Improved Process Control Through Real-Time Measurement of Mineral Content*, by D. Türler, M. Karaca, W. B. Davis, R. Giauque, and D. Hopkins, will be published by the Society of Mining Engineers (SME), and will be presented at the SME Annual Meeting and Exhibit in Phoenix, February 25-27.

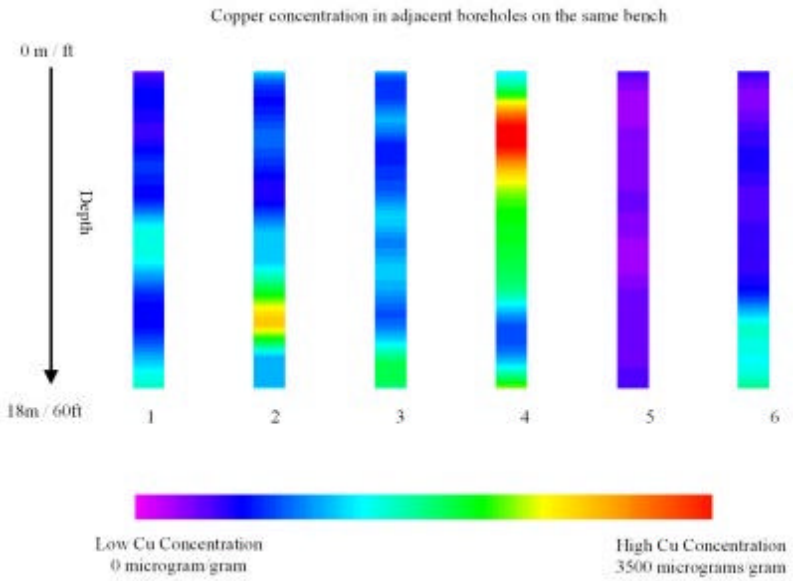
Preparations are underway for a full-scale field test that will take place in March at an open-pit copper mine in Arizona in collaboration with our project partners: the University of Arizona, Phelps Dodge Mining, Split Engineering, and Aquila Mining Systems.
In this highly collaborative research and development project, sensors and data-analysis tools are being developed for rock-mass characterization and real-time measurement of mineral content. Jim O'Neill of the Technical Integration Group is working with Earth Science's Ramsey Haught, and electrical engineer, Valerie Risk, to mount accelerometers in a collar that will be mounted on the drill stem to measure and communicate vibration data that will be analyzed to determine the feasibility of using acoustic data to detect fractures during drilling. This data will be used in conjunction with geological information, radar and other geophysical data to construct a three-dimensional fracture map of the bench.

Determining mineralogy prior to mucking in an open-pit mine is important for routing the material to the appropriate processing stream. A possible alternative to lab assay of dust and cuttings obtained from drill holes is continuous on-line sampling and real-time x-ray fluorescence (XRF) spectroscopy. Results presented demonstrate that statistical analyses combined with XRF data can be employed to identify minerals and, possibly, different rock types. The objective is to create a detailed three-dimensional mineralogical map in real time that would improve downstream process efficiency.

Dust and rock particle collection system installed on a drill rig at the partner mine.



Schematic view of the online dust/particle collection system. During drilling, dust and rock particles are collected through a nozzle placed near the borehole. A venturi-suction system using compressed air supplied from the drill rig provides a continuous sampling of material during drilling; exhaust from the venturi system is routed to the cyclone where the solid material is separated from the air. Samples are collected at the bottom of the cyclone.



Borehole profiles of copper concentration measured in six boreholes located on the same bench. Samples were collected with the cyclone system during drilling; individual samples were collected approximately every 1.5 meters (5 ft). Bob Giauque used XRF spectroscopy to obtain the copper concentration in the samples collected.

Fiber-Optic Sensors for the Petrochemical Industry – Murat Karaca

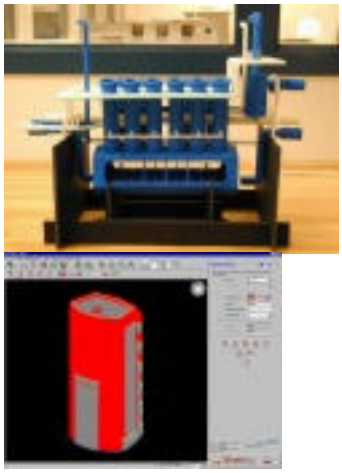
Murat Karaca, Fred Reverdy, Peter Kistenmacher, and Deb Hopkins have been working with EETD's Rick Russo and Paul Ridgeway to identify potential applications for fiber-optic sensors in oil refineries. A report was prepared for the industry partner that included a review of inspection methods currently used in the pipeline industry, a comparison between fiber-optic and piezoelectric sensors, and a survey of fiber-optic sensing technologies suitable for detection of acoustic waves and corrosion.

DesignWorks –Ken Chow

Accomplishments

- DesignWorks has continued to grow during the last quarter. Mark Scheeff joined the group in October and brings a strong mechatronics engineering background. In December, Dan Cheng moved to DesignWorks and has started helping on several projects. Software engineer, Erick Herrarte, has also been working on DesignWorks projects.
- The Fused Deposition Modeler (FDM) machine was used effectively to produce prototypes for two projects:

For the LHC cryogenic distribution box project, DesignWorks had the FDM working hard to crank out dozens of rapid-prototype parts. We used the existing Pro/Engineer-designed parts, making modifications as required for rapid prototyping, and built the piping, top plate, and chamber parts. The final 1/6-scale model (about 12-inches long, see photos below) was used by the LHC project to communicate the overall design, as well as to help define assembly procedures for the piping system.


In October, we made a full-scale model of the "Portable Neutron Generator" concept designed by LBNL's Plasma and Ion Source Technology Group. The model was a combination of rapid prototype parts built on the FDM machine and plastic parts machined conventionally. The Portable Neutron Generator was one of three technologies presented by Spencer Abraham (US Secretary of Energy) to Tom Ridge (Director of Homeland Security) as projects underway at LBNL that can help address Homeland Security issues immediately. The model made its way into several media reports, including a Physics Web article (http://physicsweb.org/article/news/5/11/14), a TV news segment (KRON evening news on 11/28/01), and Berkeley Lab's *Currents* (12/7/01, http://www.lbl.gov/Publications/Currents/Archive/Dec-07-2001.html - Terrorist).

Full-scale model of the Portable Neutron Generator.

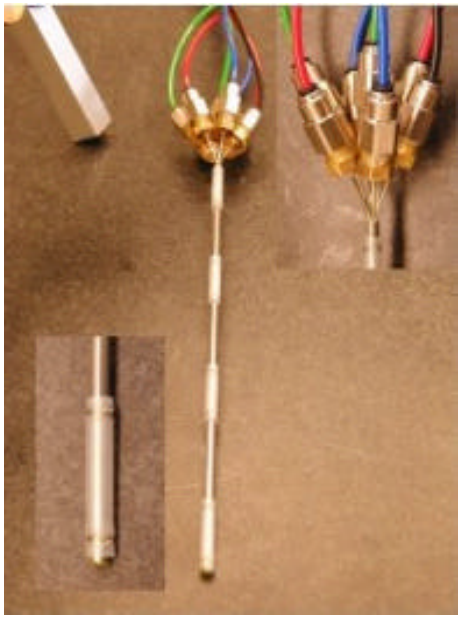
- We've made progress getting our second rapid prototyping machine set up. The Stereolithography machine (SLA 250) will enhance our rapid prototyping capabilities to include injection molding, and allows us to make parts faster and with different materials. We expect this second machine to be up and running in early 2002.
- Tim Loew was part of the Solar Motions team that placed fourth in November's Australian World Solar Challenge, the 3000-km solar car race made famous by GM's Sunraycer victory in 1987. Solar Motions is a Fremont-based volunteer nonprofit group that includes many alumni from collegiate solar car teams. Tim was involved with the design and fabrication of the 212-kg car, built mostly from donated composite materials, which rides on a newly patented in-wheel suspension designed to minimize the car's aerodynamic profile. Sporting efficient Gallium-Arsenide solar cells with a 20% efficiency and a highly efficient electrical system made in collaboration with Switzerland's Biel University, the car achieved sustained speeds of 100 kph on 1600 W of power. The bi-annual journey through Australia's Outback, which this year included 40 entries from Europe, Asia, North America and Australia, is often a showcase for new energy generation, storage, and efficiency technologies.

Technical Integration Group –Jim O'Neill

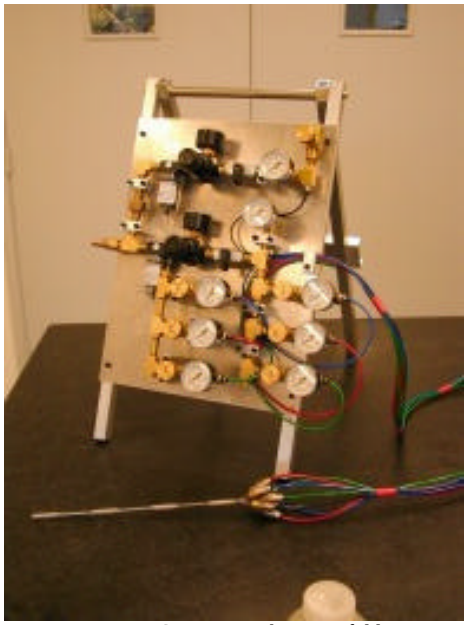
The Technical Integration Group has had a busy first quarter. For the most part we've been focusing on accomplishing customer goals and have made some progress on reorganizing the shop.
Notable Accomplishments include:

- Completion of the ALS 9.3.1 monochromater. First light was achieved with acceptable range and beam intensity.

  ALS researchers reported:
  - Beam was obtained in less than 30 minutes; a week had been anticipated.
  - The cooled first crystal and new crystal mounts have improved stability to the point that the monochromater can be scanned over its entire energy range from 2 to 6 keV; scans were previously limited to a range of approximately 100 eV.
  - The beamline 9.3.1 monochromater is presently undergoing performance tests. Results to date indicate that performance is greatly improved over the previous version.
- We welcomed Keith Franck to our group in October. Keith has extensive LBNL experience that can help in achieving many of our long-range goals. Keith has finished the ALS Long Trace Profiler (LTP) design, taken on the Infrared Thermography Chamber project for EETD, and continues to work on ALS beamline designs.
- The second mini packer prototype and a manifold system have been completed for Earth Sciences Division.



Mini Packer Probe



ESD Mini Packer Manifold

- The inspection room is finished and the new Brown and Sharp CMM is up and running.

- Many of the shop's organizational issues are still pending and being addressed when time permits. Acquiring new machines have been postponed until later this fiscal year.

Brown & Sharp CMM

Critical Issue:

After 41 years at LBNL, Don Jourdain has decided to retire. Don has been responsible for the Plastics Shop in Building 25 for many years and has provided a valuable service to many researchers and groups at LBNL. Don is featured in the Profiles section above. He is working with us to ensure a smooth transition and continued service to his customers. We wish Don the very best in his retirement.

We are still in the building phases of our Group and continue to look for key people to fill specific positions. Our primary focus is maintaining responsive, quality service for our customers in plastics as well as other technical support areas. Making the changes to be more efficient while taking care of business is a constant balancing act.

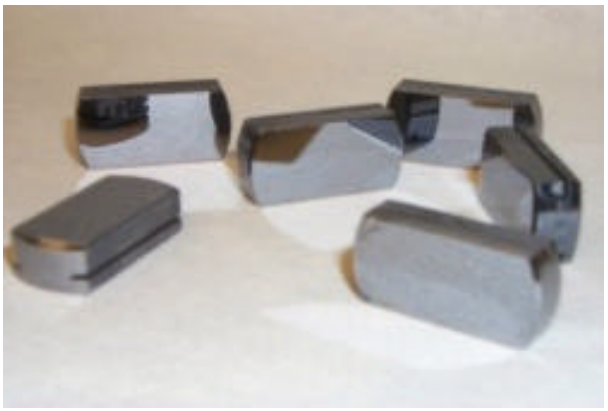
Other Work in Progress:


LHC Cryo Box Mockup


LHC Lambda Plug Prototype

HGC Capillary Needles

SNAP Wafer Deposition Fixtures

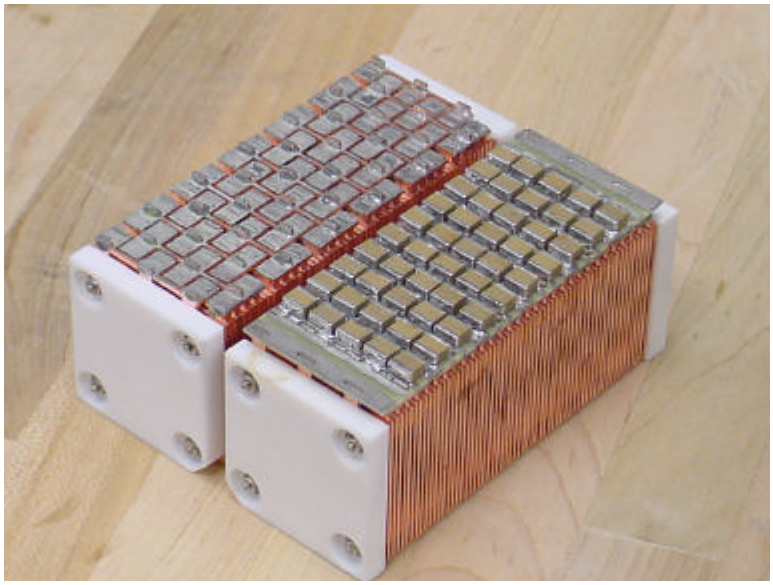


ALS Silicon Mirrors

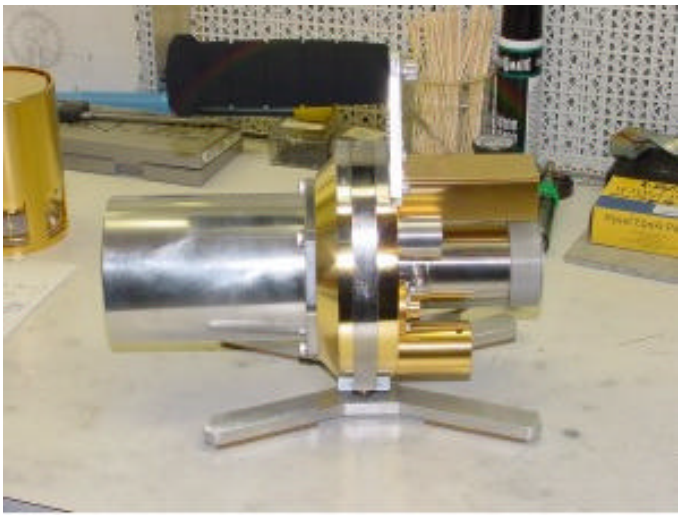
Organization

Measurement Science Group –Phil Datte

Members of the Measurement Science Group supporting AFRD went to CERN's H4 test beam hall to test the new design of the Luminosity Monitor that is being developed for the LHC. This test was designed to study enhancements of the first prototype, assembled and tested last year. The results showed that the improvements that were implemented allow for operation at the required 40 MHz. The figure below shows the two quadrants, one consisting of the detector and capacitor board, and the other showing the electrical connection without the capacitor board.



Lorenzo Fabris represented the Measurement Science Group in collaboration with LLNL at the Silicon Valley Anti-terrorism Exposition. The collaboration displayed the second-generation, portable, mechanically cooled Ge detector that is being developed in the Measurement Science Group. The device consists of a Gamma-Ray detector, low-power data processing electronics, and a USB interface for downloading acquired data from the field to a PC. In addition, there is supporting data analysis software running on Windows 2000 that provides spectrum analysis. The figure below shows the mechanically cooled detector.

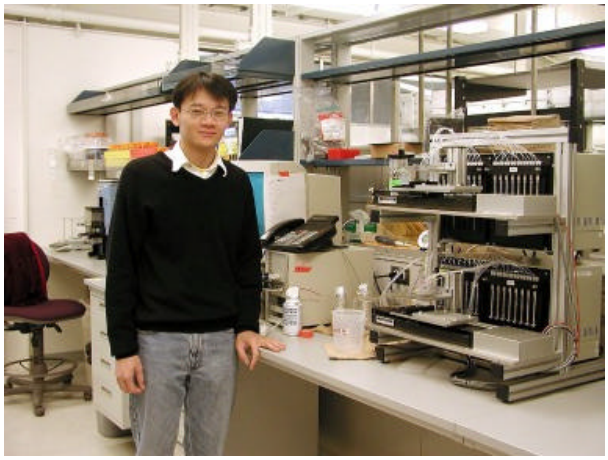


The Measurement Science Group engineering staff was well represented at the IEEE Nuclear Science Symposium in San Diego, presenting four posters/papers that discussed some of the group's current activities. Topics included the LHC Luminosity Monitor test results, a complete X-ray fluorescence detector system and also test results from Ge strip detectors.

Joint Genome Institute –Marty Pollard

Marty Pollard attended the Genome Sequencing and Analysis Conference in San Diego, October 25-28, along with a large contingent of JGI personnel. There was a great deal of interest in the JGI's use of Rolling Circle Amplification in our production sequencing process. The automation of this process was described in the October 2000 *Significant Events Report*. The JGI also announced the completion of the sequence of the Fugu Fish, the first vertebrate genome sequenced and assembled by the public sector since the human genome.

The Instrumentation Group is currently working on the installation of 20 new Molecular Dynamics MegaBACE 4000 sequencing machines. Each of these machines can sequence four times the number of samples (384) as the older MegaBACE 1000's. The JGI is the first site to get the new machines, just released by Molecular Dynamics on December 1. The MegaBACE support group consists of: Nathan Bunker (LLNL, Group Leader), Larry Nowlin (LBNL, Engineering), Lolo Cardenas (LBNL, Genomics Division), Faviola Cardenas (LBNL, Genomics Division), and Aaron Avila (LLNL, BBRP). Sofia Mitina is developing the software for data transfer from the sequencers, and Paola Pace is updating the work request system. Both Sofia and Paola are in the Software Engineering Division. Early results on production samples indicate that the new machines will produce sequencing read lengths and pass rates at least as well as the old machines.



The last piece of equipment associated with the Rolling Circle Amplification automation described in the October 2001 *Significant Events Report*, was a custom dispenser system developed by software engineer, Ray Chen, along with Mechanical Engineering's Karl Petermann and Charlie Reiter, and Mario Cepeda of the Technical Integration Group. This custom dispenser is now in use for processing seventy-five 384-well plates per day. This dispenser is being used to load sequencing reagents to the samples during one step of the overall production process. The reagents are extremely expensive, so minimizing dead volumes in the instrument are an important part of the design. This machine holds its 2-microliter dispense calibration much better and longer than the previous peristaltic pump instruments (i.e., providing better volume accuracy).

The LBNL Patent Office has filed a provisional patent for a Hybrid Magnet developed by David Humphries. A dozen magnets were assembled in the Bldg. 25 and Bldg. 77 shops.

They are used in the Beckman Biomek FX robots for sample clean up after the cycle sequencing reactions as part of the RCA sample production line.

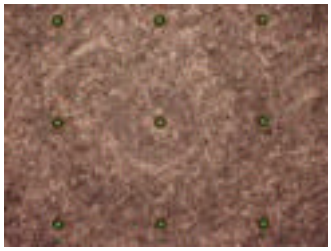
Design & Fabrication –Lowell Koht

Precision Machine Shop

- Design & Fabrication increased their precision machining capabilities by acquiring a Roku Roku machine and training Dan DeBoer in its use. This high-speed, high-precision CNC Milling machine has been in continuous use since it was brought online in mid-September.

Project examples include:

Machining of a one-inch burner with 37° and 45° blades for EETD



Micro-hole drilling of 0.002-inch holes in copper and vespel

Micro-milling of 0.005-inch slots for test electrodes used in AFRD research

Wireless LAN Installation

- Design and Fabrication began installing hardware and software that will ultimately process all fabrication orders online and through one database. In our initial phase, a wireless local area network (LAN) was created in the Main and Precision Machine Shops and software was installed by Predator to operate all machines on the new LAN.

- To protect our new (and old) precision machining tools, we upgraded their home. The Precision Machine Shop was tiled and painted to ensure a suitable work environment for the functions performed there. A number of new machines for milling and turning will be added to this area in the first quarter of 2002.

Machine Shop

- Requiring two shifts, the Machine Shop machined two Beamline Analysis Magnet Poles for the 88-Inch Cyclotron within a four-week window.

- The Shop machined the IDN-BL 11.0.2-EPU 5.0 Magnet Structure Backing Beams Q1, Q2, Q3, and Q4 for ALS within six weeks.

- The machining of two PEP-II FWB LEB Inner Chambers was completed. This required cutting the inside of seventeen 7-inch chambers. SLAC brought this to LBNL for our high Z-axis capability on the Sodick Wire EDM. This job came with a six-week time constraint and was completed three weeks early.

Vacuum Coating Laboratory (ongoing research support):

- The discovery of bright organic electro-luminescent diodes has stimulated intense research in order to understand the physics and chemistry of electron transport and recombination. In the simplest case, a device can be structured with an organic electron-emitting layer and a polymer-hole-transport layer sandwiched between two metal electrodes. This work is ongoing at the facility.

- Vacuum Coating is also devising novel methods of carbon nanotube growth by using Chemical Vapor Deposition to construct a ring-shaped electron disc source that may be used in an innovative linear accelerator design.

Sheet Metal and Weld Shops:

- Sheet Metal and Weld Shop personnel returned to working day shifts after four months on swing shift.
- The seismic retrofit construction in Building 77 has provided a vehicle for major clean up and reorganization of both the Sheet Metal and Weld Shops.
- Training began in ultra-high-vacuum welding techniques. This will provide greater flexibility and a faster turnaround for this particular service.
- The radiation covers for the ALS Superbend magnets were completed on time and on budget.

UHV Cleaning Facility:

- A new rinse tank strategy was developed and implemented, to provide thorough rinsing of parts while consuming far less water than the previous method. This new method realizes cost benefits through reduced water consumption, and constitutes a more environmentally responsible method of operation.

Advanced Light Source:

The Assembly Shop recently began construction of the first of two Elliptically Polarized Undulators for the ALS.

Assembly Shop:

The Assembly Shop is currently assembling the last Standard Cell for a LANL project. In just over three years, this shop has assembled and tested:

- three prototype cells
- eight injector cells
- forty-eight standard cells weighing 14,000 lbs. each
- sixty, 2300-turn solenoids weighing 150 lbs. each
- eighty-two 230-kv insulators weighing 105 lbs. each.

Cell housings and bore tubes are vacuum-leak tested and the housings are then filled with eighty gallons of Diala AX Insulating Oil. The bore tube is evacuated to ~$1x10^{-7}$ Torr and the cell is then electrically tested at 200 kV for 2000 cycles. The Diala is then pumped out after testing.

Electronics Engineering –Peter Denes

Message from Richard Jared

When I became Department Head, I had two main objectives. One was to rebuild the infrastructure of Electronics Engineering (EE), and the other was to strengthen the management structure. These items were prerequisites to advancing the department into new initiatives, technologies and challenges, and to help provide a dynamic and interesting environment for the future.

The thrust of the infrastructure initiative was to obtain, install and support the tools needed to do electronics engineering. Results of these initiatives have yielded a strong structure for AutoCAD, OrCad, Synopsis, Mentor Graphics, and Cadence software with both system and user support. Workstations have also been upgraded. This area will continue to evolve in support of the EE Department's needs.

The second issue was to strengthen our management structure. I was able to hire two new group leaders, Henrik von der Lippe and Peter Denes. These appointments increased our numbers and complimented our existing group leaders, allowing us to enter phase two of the management structure improvements. Phase two consisted of transferring authority and responsibility to the group leaders (empowering them), rather than following a monolithic management structure in which most decisions are made at the top. The group leaders are now in more control of decision making on critical issues associated with the department, its future development, and its direction of growth. This leads to group leaders who are familiar (experienced) with important decisions and why they were made.

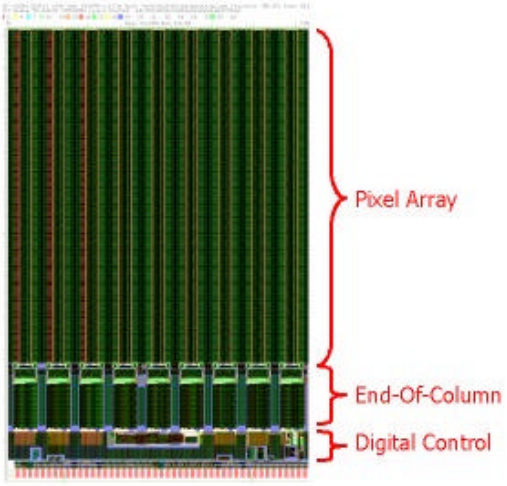
In leaving this position, I feel much progress has been made in these two areas. We still have a ways to go in fully meeting these objectives, but I have complete confidence in the group leaders and Peter Denes, the new head of the Electronics Engineering Department, to meet the challenge of this objective. Peter endorses what we have accomplished over the last year and a half, and has three areas that he would like to initiate to strengthen Electronic Engineering. First, to have EE become more integrated, second, to find new and better ways to solve problems, and third, to expand our role in new initiatives.

I wish to thank all those who have helped and have contributed to the success of the department during my appointment as Department Head. Your cooperation and support were essential to the success of our achievements.

Thank you very much,
Richard C. Jared

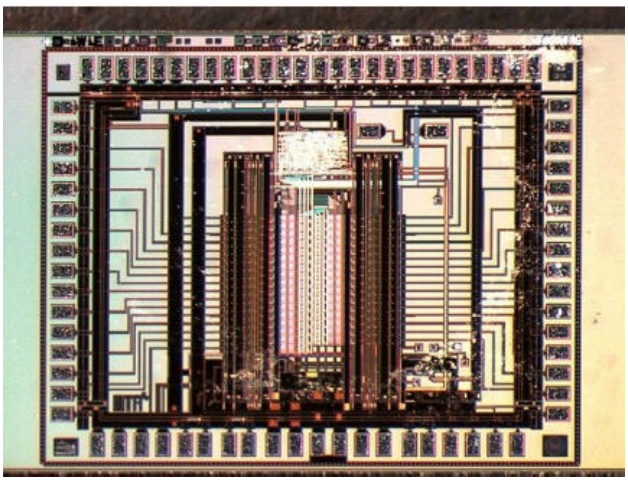
ATLAS Pixel Front End Chip –Peter Denes

This November, LBNL submitted its largest chip so far: the front-end integrated circuit for the ATLAS Pixel detector at the LHC. The chip contains 2.5 million transistors in 0.25µ CMOS technology. This circuit, mounted on the detector elements closest to the interaction point, must sustain considerable radiation doses, and has thus been designed using techniques which produce radiation-tolerance by layout and design. The pixel front-end consists of all of the readout elements needed for 160 x 18 pixels of 50µ x 400µ. The pixel detector elements are implanted in a separate silicon chip bump bonded to the readout chip. The submitted IC is due back at LBL in January for testing and evaluation.



Positron Emission Tomography – Emanuele Mandelli

A Positron Emission Tomography (PET) detector module is being designed in collaboration with Life Sciences Division to identify 511 keV photons from positron annihilation with good spatial and temporal resolution. The module consists of an 8 x 8 array of 3-mm^2 by 30-mm deep LSO scintillator crystals coupled on one end to a single photo multiplier tube, and on the opposite end to an 8 x 8 array of silicon photodiodes. The photo-multiplier tube provides an accurate timing pulse and initial energy discrimination for the 64 crystals in the module, while the silicon photodiode array identifies the crystal of interaction.



In order to identify the crystal of interaction among several modules, a 32-channel Winner-Take-All (WTA4) integrated circuit was developed. The WTA4 selects the highest of its input and output signals for each channel, including the channel address, analog waveform and peak, and the time of occurrence. The chip was returned on Nov 26th and test results will be available early this year. A photo-micrograph of the chip is shown at left.

SNS Electronics –Alessandro Ratti

As the SNS project nears completion, we are preparing for beam commissioning of the systems. The ion source and LEBT beam tests were successfully completed. The front-end system's injector proved reliable; satisfactory operation was achieved during a 24-hour-per-day ten-day run. The electronics performed very well, thus proving the effectiveness of the EMI protection and remote control operations. The only downtime resulted from a bad cable; there were no additional failures in the electronics systems.

The RFQ has now been prepared for testing, with the klystron tuned to deliver a minimum of 600 kW during the pulse. Tuning has been completed, achieving a field flatness of better than 2%. The cavity has been moved to its final location and is nearly ready for commissioning to full power. All eight RF windows and drive loops were installed after the windows were treated by the Plasma Deposition Group to add about 10 Angstroms of TiN. All interfaces with the EPICS-based control system are completed and tested, including the automatic conditioning algorithm that is now available to support cavity testing under power. The ion source and LEBT are also mounted to the cavity, in preparation for the first beam tests.

The MEBT sub-systems are well under way. All rebuncher cavities have been received and three of them have been tested to full power. All tuners have also been received, which now allows us to begin integrating the low-level RF system with the cavity and amplifiers. System integration is ready to begin, as soon as the last bench tests of the LLRF system are completed in December. Fabrication of the remaining LLRF systems has also begun. Cavity n.4 is now installed in its final location on the third raft of the MEBT.

Extensive x-ray surveys have been conducted in collaboration with the EH&S group during the high-power testing of the cavities to monitor the radiation levels produced by the cavities, and determine the amount and location of the necessary shielding. This effort will be summarized in the RWA document, which will support operation on the front end.

All controls interfaces have been designed and we are now in the process of packaging and laying out the installation on the MEBT raft. Significant installation efforts are underway to prepare all supporting racks. The AC power installation has been completed; all cable trays within the racks are installed. Now that the RFQ raft is in place (soon followed by the MEBT), we can begin the installation of the trays between the racks and the beamline.

ALS Electronics –Walter Barry

New electronics for the transverse coupled-bunch feedback system, enabling additional power amplifiers to be added to the system, were installed and commissioned during the Superbend shutdown. One new high-power amplifier for the vertical plane has also been successfully tested with beam and will be phased into operation in upcoming accelerator physics shifts. The power/gain upgrades will increase the stability margins of the system. New diagnostics for transfer-function measurement are also being added to the system.

The electrical and mechanical design of higher order mode (HOM) dampers for the storage ring RF cavities is complete; fabrication will begin soon. Installation of the HOM dampers is planned for the April 02 shutdown. Initial tests of an additional low-frequency longitudinal-feedback loop for suppressing the mode-zero instability were successful. Circuit boards for storage-ring klystron beam-current control as an energy savings measure have been fabricated; testing will begin soon.

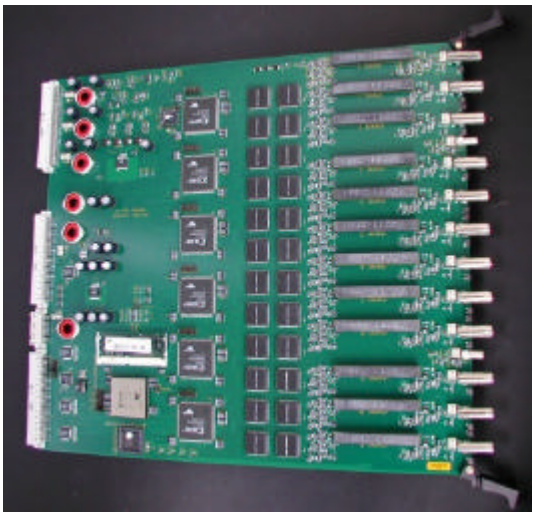
Modulation of the storage ring electron beam from a local radio station has been observed and eliminated. The signal was being picked up on the control ports of the active mixers in the transverse coupled-bunch feedback system. The addition of low-pass filters to these ports solved the problem. The ability to perform on-line beam-transfer functions with the transverse feedback system has been demonstrated. This new diagnostic is extremely valuable for monitoring beam stability.

STAR Electromagnetic Calorimeter Readout –Bob Minor

The second round of installation of electronics for the STAR EMC was completed in December. Three additional Tower Digitizer crates, and one additional Shower Max crate are being brought on line for the remainder of this year's run. Twenty-two and one half of the twenty-four EMC modules installed at STAR are now instrumented. A total of 60 modules are scheduled to be instrumented by the end of FY02, and a total of 120 modules by the end of FY03.

KamLAND –Harold Yaver

KamLAND installation is almost complete. KamLAND (Kamioka Liquid Scintillator Anti-Neutrino Detector) is a large neutrino detector consisting of 2,500 large photo-multiplier tubes (PMTs). It is located on the island of Honshu in Japan. The scaling up of the electronics has gone well and performance has not degraded from that of a prototype that was tested last year. The electronics is packaged on a mixed signal VME board, which includes the analog electronics to process the PMT signals, the digital readout, and the VME interface. The hardware's basic function is waveform capture. The sampling speed of the board is adjustable. It is operating at about 500 MSPS, but can achieve 1 GSPS. The board is a 9U size and processes 12 channels. Each channel is self-triggering, and can trigger on signals as low as 0.35mV with a full scale of 4V. The system's large dynamic range and relatively low noise (for a VME environment), yields performance that is unprecedented. More information is available at: http://kamland.lbl.gov/. The Kamland readout board is shown at right.



SAIC Development – Henrik von der Lippe

We have completed the design of a 130-channel X-ray readout integrated circuit (IC) for Science Applications International Corporation (SAIC). The IC will be used in their future X-ray equipment available to Explosive Ordnance Disposal professionals, providing the ability to quickly and efficiently search for weapons, drugs, and contraband in areas too difficult or time consuming to search by hand.

Software Engineering –Alan Biocca

ALS Controls

Many members of the group attended the recent International Conference on Accelerator and Large Physics Controls at the San Jose Fairmont. Department members presented several papers. The conference was followed by a two day EPICS Collaboration meeting.

Bill Brown is retiring from the ALS Controls Group at the end of the calendar year. Eric Williams was recently hired to take over Bill's work on the Accelerator Controls Systems.

Alan Biocca was invited to sit on a review committee at the Canadian Light Source (CLS). The first trip to Saskatoon, Saskatchewan was in early November. Their Light Source (pictured at left) is under construction and is scheduled to begin operations in 2004.

Joint Genome Institute at Walnut Creek

Software Engineering staff members Sam Pitluck and Yunian Lou made presentations at the 13th International Genome Sequencing and Analysis Conference in San Diego, October 25-28, 2001. They presented the following posters:

> *Production Workflow Tracking and QC Analysis at the Joint Genome Institute,* Heather Kimball, Stephan Trong, Art Kobayashi, Sam Pitluck, Yunian Lou, Matt Nolan, authors.
>
> *Encoding Sequence Quality in Blast Output by Color Coding,* Sam Pitluck, Paul F. Predki, Trevor L. Hawkins, authors.

CXRO Nanowriter Group

Eugene Veklerov continued to provide software support for the NanoFabrication group. Specifically, he

- worked on perfecting the algorithm for generating zoneplates;
- added new functions to tools that he had previously written, such as cflt-nwx,
- built new databases; and
- provided help to the manufacturer of the NanoWriter in their attempt to upgrade their part of the software.

Systems Engineering –Bill Edwards

Copies of the newly completed, *A Systems Engineering Primer –For Every Engineer and Scientist* (formerly, *The LBNL Systems Engineering Handbook*), are now available by contacting Ed Kujawski or Bill Edwards. It will soon be available on the Systems Engineering website.

The Engineering Division has formed a Project Management Advisory Board (PMAB) to make LBNL Project Management knowledge and expertise available to the entire Lab. Engineering Division has played a significant role in managing several major General Sciences and ALS projects. The Board plans to document practices that have worked, capture some of the "lessons learned," and help create high-quality proposals and ensure effective management of Laboratory projects. Board members include: Peter Denes, Joseph Rasson, Vic Karpenko, Russ Wells, Dick Digennaro, Lowell Koht, Alan Paterson, Paul Luke and Bill Edwards (chair).

Planned Actions:

- Update SE Website (January '02).
- Begin Systems Engineering support of the Femto Source proposal (Ed Kujawski; January '02).

Advanced Light Source –Alan Paterson

Accomplishments:

- ALS Mechanical Group reorganization
    - Two new Deputy positions have been created within the ALS Mechanical Group.
        - Ross Schlueter has assumed the role of Deputy for Accelerator and Magnetic Systems. He provides the technical leadership role for all magnetic systems and will advise on accelerator-related projects.
        - Rob Duarte has assumed the role of Deputy for Synchrotron Beamlines and Experimental Systems. As Deputy, Rob is tasked with advising on methods and standards that are to be applied to the engineering of these systems. He will assist in the planning for new facilities, the development of project scope, technical reviews, resource requirements and the writing of documentation.
- Successful operation of the ALS with Superbends.

- Experimental floorplan for sectors 11 through 1 negotiated.

The rapidly dwindling experimental floorspace at the ALS is posing increasingly difficult problems for the beamline engineers charged with executing new projects, while accommodating the existing experimental needs. As Lead Engineer for the SIBYLS facility (see below), Daniela Cambie has taken the lead in resolving the many conflicting needs of the multiple research groups that must cohabitate in sectors 11 through 1.

- Four new beamline projects initiated:
    - The Structurally Integrated Biology for Life Sciences (SIBYLS) Beamline
    - High-Pressure Beamline
    - LIGA Beamline for Axsun Corporation
    - LIGA Beamline for Sandia Laboratories.
- The two new LIGA Beamlines are to be constructed in sector three of the ALS where there are two existing LIGA Beamlines already in operation. This layout was conceptualized by Nicholas Kelez, and has been accepted by ALS management and the customers. It results in extremely efficient use of the ALS floor in an area of the building where space is severely restricted. Once completed, this LIGA complex will be a world standard for the implementation of this technology.
- The SIBYLS and High Pressure Beamlines are located in sector 12 of the ALS, and the geometry of the concrete shielding required to accommodate these beamlines proved to be an engineering design challenge. A solution to the issue was developed by Daniela Cambie; the plan passed final design review in November.

- New Accelerator Project gets LDRD support.

    - The proposed new IR-storage ring project team held a kick-off meeting following the award for LDRD funding for this fiscal year. This project, much anticipated and enthusiastically promoted by the ALS accelerator physics group, is in the initial stages of forming the engineering team. Ross Schlueter is taking the engineering technical leadership role. Will Thur and Ken Rex have been instrumental in developing the initial conceptual layouts for this machine. When approved, this new ring will be installed on the roof shielding of the ALS Booster Ring and will add a significant capability to the scientific program at the ALS.

Superbend Project

Operations began in October, following the installation of three superconducting bend magnets last summer. This significant change to the machine did not have any negative impact on operation. The magnets are operating reliably at their design conditions; to date there has been no loss of beam to users as a result of Superbend operation.

This project involved replacing three of the 36 conventional 1.3-T bending magnets with 5.7-T superconducting magnets, along with six new quadrupoles. This introduction of higher-field magnets was motivated by the demand for additional bright X-ray sources with photon energies in the 10- to 30-keV range. These magnets enable experiments in protein crystallography, X-ray tomography, and powder diffraction.

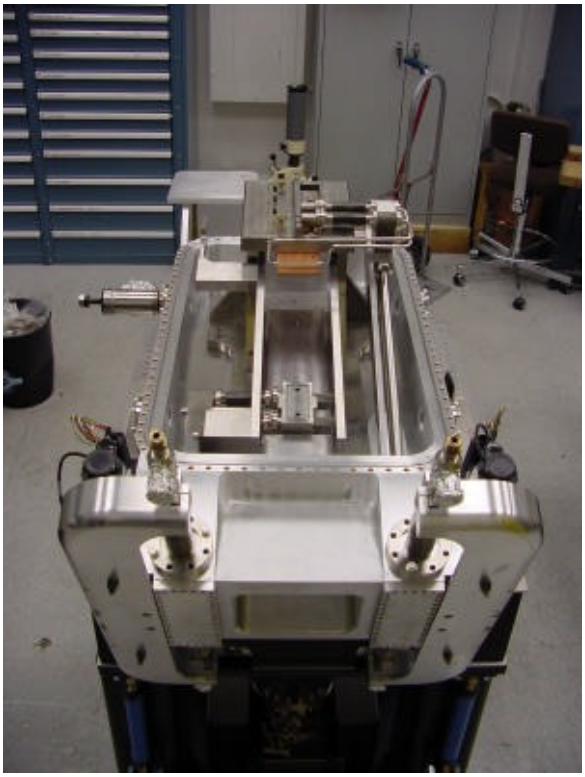
Superbend Beamlines

Three new Protein Crystallography beamlines using Superbend photons are in operation. These new beamlines, with novel "mini-hutch" experimental end stations, were completed by an engineering team that includes: Rob Duarte, Dave Plate, Daniela Cambie, Nicholas Kelez, Mike Kritscher, Curtis Cummings, Lional Bonifas, Rob Patton, and Andy Lim.

- The UC Berkeley Beamline at 8.3.1 is operational and taking data.

- The Howard Hughes Medical Institute Beamline 8.2.1 is operational and taking data. Howard Hughes Medical Institute Beamline 8.2.2 is scheduled to begin collecting data; commissioning of the end station is scheduled for December.

Molecular Environmental Science (MES) Beamline



- Monochromater

The monochromater with “dummy" optics has been assembled and is currently undergoing testing and calibration in Building 2. The pre-mirror and gratings are scheduled for delivery in February.

- M201 Mirror

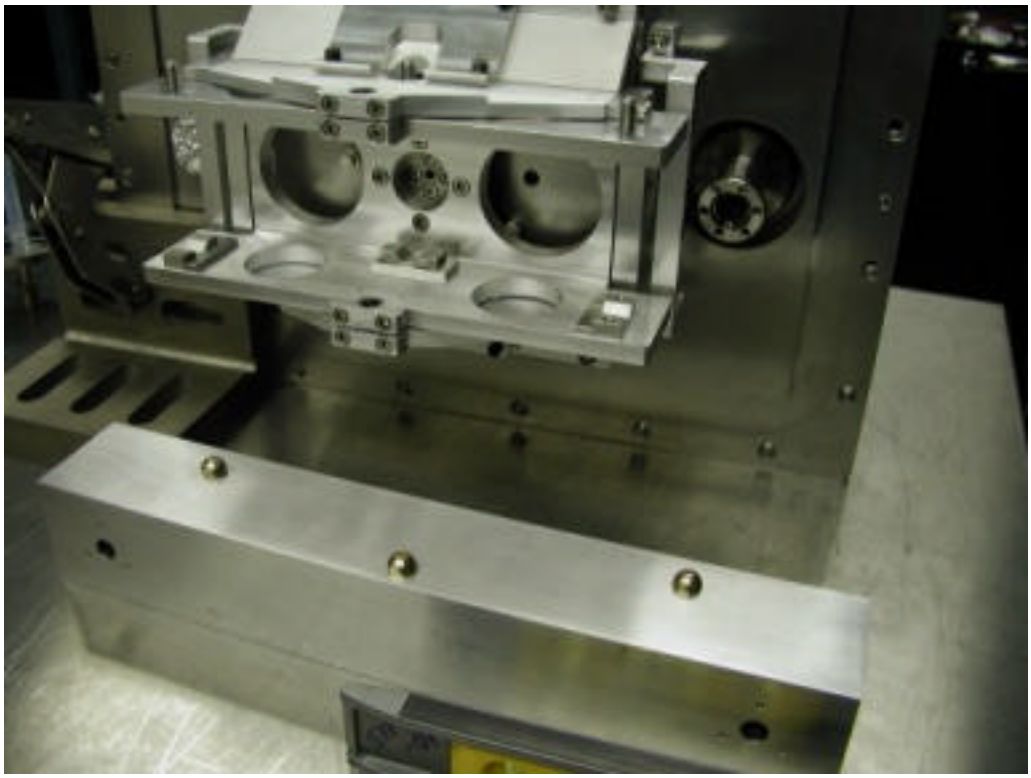
  The mirror polishing is progressing well, and the optic is scheduled for delivery in late January. The mirror support and motion mechanism is currently being assembled in Building 10.

- M204 and M205 Mirrors

  The refocus mirrors have been ordered. The detail design of the two systems is progressing, and a number of components have been ordered.

- KB Mirror Pair

  The final design review for the KB pair was held in December. Work is underway subcontracting the optics and completing the detailed design of the support mechanism.



- Fabrication is on schedule for installation during the upcoming ALS shutdown in April 2002. An issue is completion of the MES project's Elliptically Polarizing Undulator in the 77A shops in time for magnetic measurements scheduled for March.

- Completion of the MES project, scheduled for October 2002, is dependant upon successful testing of the newly designed monochromater. The evaluation of the monochromater began in December.

- We are working to resolve fabrication issues associated with the nickel-plated invar mirrors used as the first optic in the protein crystallography beamlines. Delamination of the nickel has been observed; tests and backup fabrications are being initiated with vendors.

- Re–engineering of external cryogenic plumbing for the Superbend magnets is required to remove a heat leak that was identified during commissioning. Tests are underway on the spare magnet.

Engineering and design of superconducting insertion devices for femto-second research, along with a workable conceptual design to locate two of these devices in Straight 6 of the ALS, is underway. This arrangement may be required to give 50-femto-second pulses. An engineering team under the leadership of Ross Schlueter and Steve Marks is working on the issues.

Heavy Ion Fusion –Victor Karpenko

The Heavy Ion Fusion Virtual National Lab (HIF-VNL), a collaboration between LBNL, LLNL, and Princeton Plasma Physics Lab, has recently achieved several programmatic milestones used by DOE to measure HIF-VNL performance. The Building 58 technician crews, led by Ralph Hipple (mechanical) and Bill Strelo (electronics), demonstrated first-rate craftsmanship, skill, and dedication in upgrading the 2-MeV Injector, and in the assembly and installation of the high current experiment (HCX) electrostatic-quadrupole transport system in the Building 58 tunnel. Additionally, they contributed to the delicate assembly of the 500-kV Source Test Stand (STS500) high-voltage column, made of ceramic, stainless steel, and epoxy. This insulator column, together with a diagnostic tank, constitutes the vacuum chamber; sources will be placed in the chamber, where ions are extracted and measurements are performed. The STS500 column currently holds vacuum in the 10^{-8} range; the column reached the performance specification for a 500-kV pulse at 20 μ–second duration, all within 10 days of initial startup. High voltage will be turned on before the holiday shutdown, and commissioning of the HCX will continue in January. The VNL staff would like to express their appreciation for the diligent efforts of Bill, Ralph, and their crews.

Spallation Neutron Source –Ron Yourd

A series of Ion Source and LEBT runs have been completed to demonstrate improved performance and reliability for SNS operation. A week-long, round-the-clock beam test was completed November 6th, with only a few interruptions caused by vacuum trips and electron dumping issues. Approximately 20 mA of low-emittance H^- beam was delivered at duty factors ranging from 3 to 6%. A series of antennae were also tested with varying thicknesses of porcelain coating; so far a reasonably thick coating (0.7 – 0.8 mm) appears to provide a good combination of performance, efficiency, and durability. During November, we also tested the LEBT chopper system in its new configuration with the

summing network. It performed very well up to the full 6% duty factor, giving a 20-ns rise and fall time; this is nearly 20% better than required for this subsystem.

All four RFQ modules have been joined together and mounted in the support structure; all the vacuum, RF, and water systems have been installed and qualified. Excellent field flatness was achieved in the fabrication and tuning, and the resonant frequency was adjusted by final trimming of the fixed tuners. The controls interface for all subsystems was extended to cover all testing and commissioning features. The RFQ power conditioning was initiated, and a power level of 50 kW at low-duty factor has been reached. The fully assembled RFQ was moved into final position for installation and connection to the LEBT exit just before the holiday break.

The Medium Energy Beam Transport (MEBT) section is also making excellent progress. All systems and sub-components have been received and tested; most have been installed and aligned onto one of the three rafts supported by the MEBT frame structure. Electronic systems are also progressing well, and instrumentation and beam diagnostic components are being characterized.

The control system and the integrated-testing program continue to make excellent progress as well, and all apparatus is being installed, tested, and checked out incrementally as they become available. A busy schedule of FES integrated-beam testing is planned for the next several months, and disassembly and shipment of the completed SNS Front End System to ORNL is planned for June 2002.

Superconducting Magnet Group – Victor Karpenko

Roy Hannaford is assuming the responsibility of supervising the technical effort for the Superconducting Magnet Group. We want to thank Jim O'Neill for his contribution to the group. Jim, named Group Leader of Technical Integration Group, will continue to remain active in Supercon in an R&D role.

Division Support

Environmental Safety & Health –Weyland Wong

A few important ES&H reminders:

Please, please don't put just anything in the trash or salvage hoppers. Hazardous waste must be handled in the proper manner. If you are not sure, please ask. Some dangerous and potentially dangerous items were recently discovered in salvage containers:

- Picric acid
- Hydrochloric acid in a plastic jug
- Titanium metal powder (flammable solid)
- Used sharps containers
- PCB capacitors
- Adhesives
- Can of grease
- Calcium metal in a glass jar
- Aerosol cans of paint
- Cans of paint
- Lead acid, alkaline, and NiCd batteries

The improper disposal of hazardous wastes can lead to extra scrutiny and citation of the Laboratory, environmental pollution, and serious injury.

The Accident Review Board charter and membership list is now available online at http://engineering.lbl.gov/esh/documents/revboardcharter.pdf.

January is a good time to update your JHQ. It should be done at least once a year and any time your assignment or work changes. It's quick and simple to complete this process online with your supervisor.

Self-Assessment Program

We have inspected the following four buildings for FY02: Buildings 80, 62, 77, and 25. We will inspect the Building 46 complex beginning January 2002. Our objective is to provide everyone in Engineering with a safe place to work. Some deficiencies were found during our building walkthroughs, but were corrected in a timely manner. We commend the Self-Assessment Teams; keep up the good work!

Sponsored Research Administration –Lisa Rebrovich

Accomplishments:

- In FY01 we spent $5.6M. For FY02 our estimated spend plan is $7.7M (including LDRD projects). This is an increase of approximately 36 percent.

- Forty-eight projects are open, five of which are newly funded projects. Congratulations to Lou Reginato for receiving Phase II funds on the BNCT project.

- Spending plans on all projects have been prepared for FY02. The spending plans provide important cost information that is used to prepare the management report.

- Seven proposals were prepared in October and November.

- Bob Minor and Lisa have been working closely to bring the STAR electronics project to the Engineering Division. Funding for the project ($887K) is expected in January. This has been a difficult task, in particular, convincing DOE to send the funds directly to LBNL. Direct funding saves a lot of project overhead. The next step is to get a letter of commitment from DOE and request Bridge Funding.

- DOE has approved new forward pricing rates for FY02. G&A and Site Support have been combined into one General Rate. The material-handling burden has been eliminated. The procurement burden is now 5 percent, and also applies to travel. This is considerably less than the previous travel burden of 20 percent. A 0.84 percent Safeguards and Security burden has been established for all WFO projects (excluding WFO projects for other national labs).

Issues:

- DOE funding is trickling in slowly but surely. We are no longer on continuing resolution status. We hope to be 85-percent funded for DOE projects by January.

- PI's need to work closely with Lisa to avoid overruns when their projects near completion. Lisa can provide you with estimates so that you don't overspend your project in the last month. Overruns get reported to DOE as unbilled costs, so we need to be careful not to overspend the amount available to the project.

Planned Actions:

- The annual call for Budget Formulation for FY04 was kicked off in December. Lisa plans to setup a meeting with Department Heads/Group Leaders and the Engineering Division Director in order to come up with a budget for FY04. The meeting is scheduled for January. Lisa needs to submit the budget to the Budget Office in the beginning of March. Annual FWPs are due at the same time.

Finance –Bob Liu

Accomplishments:

- Finance presided over the smooth fiscal year-end closing for all three Engineering funding sources: org burden, recharge, and overhead.

- The year-end expenditure process was tightly controlled and coordinated with the Department Heads to ensure all transactions were properly executed.

- The Engineering project tree was streamlined to reduce accounting errors in the future.

- The FY02 working budgets were formulated and reviewed with Department Heads and Group Leaders. These initial budgets were entered into Janus.

- Department Heads and Group Leaders were provided with the necessary information to formulate departmental training programs; these programs will impact the department's working budgets.

Issues:

- Although year-end expenditures were less than last year, and better coordinated, our goal this year is to further reduce year-end spending.

- More aggressive reconciliation efforts are needed at administrative levels to prevent audit errors.

Actions:

- More precise expense plans are needed at the department and group levels to minimize historically high year-end expenditures.

- An accounting reconciliation process will be developed for monitoring S&E expenditures in the shops; upon successful implementation, the process will be applied to all units. Administrative support staff members will be trained in the new procedures.

Human Resources –Leslie Cobb

Accomplishments:

- Succession planning is underway. Michelle Gachis has been meeting with Department Heads to identify critical skills, and develop plans for maintaining sufficient depth in those areas. This is an ongoing effort.

- A new Human Resources Department Head, Randy Scott, joined the Lab in December. He brings a lot of experience and enthusiasm to the position. Engineering Division employees will continue to receive their HR services through the Engineering HR Office: Leslie Cobb, Michelle Gachis, Rita McLean, and Pamala Williams-Perkins.

Issues:

- The new rules regarding limited and rehired-retiree appointments have left many employees, and in some cases, their supervisors, confused about how the guidelines apply to their specific situations. Rita McLean can provide detailed information and a calendar to show exactly how the new rules will affect each individual.

- If you've moved during the past year, now is a good time to make sure the Lab has your new address where you should receive your W2 forms. There is a self-service website for making changes to personal information: http://selfservice.lbl.gov.

Property & Space –Barbara Davis

The wall-to-wall property inventory that began on October 1st was concluded November 30th. We were responsible for locating 1182 items totaling $14,309,806.68. As of November 30th, we located 1169 items, leaving 13 items unaccounted for. Three of these items, totaling $30,654.00, are being transferred to Facilities and will be removed from our inventory in January. The remaining ten items, totaling $65,935.73, will be charged against the Engineering Division's FY02 budget. These charges will be passed on to the responsible department. If we can find the remaining items before January 31, DOE has agreed to give us credit.

If anyone has seen any of these items please give me a call at x7840 or email me at badavis@lbl.gov. Please see the chart on the attached page for a list of the missing items. I would like to extend a special thank you to everyone who assisted the two contract employees and myself in locating the 1169 items.

Engineering Division

SIGNIFICANT EVENTS REPORT

Missing Property List

Identifier	Official Name	Manufacturer	Model Number	Serial Number	Asset Value
INV 6101331	WELDER-SEAM	SEEDORF	8422	11468	17,050.00
INV 6100945	WINDER-COIL	FMC	PX71708	WA760982A	6,552.00
INV 6101195	CHAMBER-VACUUM	WHITTAKER	CHAMBER-VACUUM	1862	21,599.00
INV 6110869	BENCH-CLEAN	PURE AIRE	0H1012	408	10,645.00
INV 6076257	COUNTER-COMPUTING	HEWLETT PACK	5360A	153	6,055.00
INV 6123036	ANALYZER-SPECTRUM	HEWLETT PACK	8556A	1935A17063	11,604.00
INV 6329292	COMPUTER-PC	CSM	486133	98022401	1,000.00
INV 6360332	COMPUTER	MICRON	AN430TX233MMT	11038140003	2,259.10
INV 6421606	COMPUTER-PC	DELL	MMP	598IB	2,000.00
INV 6349672	COMPUTER	MICRON	PORTLANDP11266MT	9975980010	4,158.15
INV 6350258	COMPUTER	MICRON	ANCHORAGE200MMT	9896950007	3,151.15
INV 6368215	COMPUTER	MICRON	AN430TX233MMT	11970890001	2,368.71
INV 6253955	CONVERTER-AD	LBNL	ADC3110		8,147.62
					96,589.73
	Credit from Facilities on Highlighted Items				**-30,654.00**
	Division Total				**65,935.73**

Engineering Division

Significant Events Report

January 2002

Index

Organization

Measurement Science Group
Joint Genome Institute
Design & Fabrication
Precision Machine Shop
Machine Shop
Electronics Engineering
Message from Richard Jared
ATLAS Pixel Front End Chip
Positron Emission Tomography
SNS Electronics
ALS Electronics
STAR Electromagnetic Calorimeter Readout
KamLAND
SAIC Development
Software Engineering
ALS Controls
Joint Genome Institute at Walnut Creek
CXRO Nanowriter Group
Systems Engineering
Advanced Light Source
Superbend Project
Superbend Beamlines
Molecular Environmental Science (MES) Beamline
Heavy Ion Fusion
Spallation Neutron Source
Superconducting Magnet Group

Division Support

Environmental Safety & Health
Self-Assessment Program
Sponsored Research Administration
Finance
Human Resources
Property & Space